89th Annual Purdue Road School

Drainage, Drainage, Drainage

— or —

"A Primer on Base Flood Elevations and their Determination"

Presented By:

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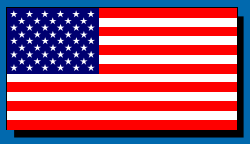


March 26, 2003

Goals

- **Overview of BFE Determination**
- **Keep Things Simple**
- **Be "Un-Boring"**

Presentation Outline

- Basic Definitions
- Why New Mapping
- What Happens with New Mapping

Presentation Outline

- FEMA Zone A Areas
- A “Minor Site Assessment”
- Detailed Hydraulic Analysis

Presentation Outline

- **Examples**
- **Summary**
- **Questions…**

Some Basic Definitions

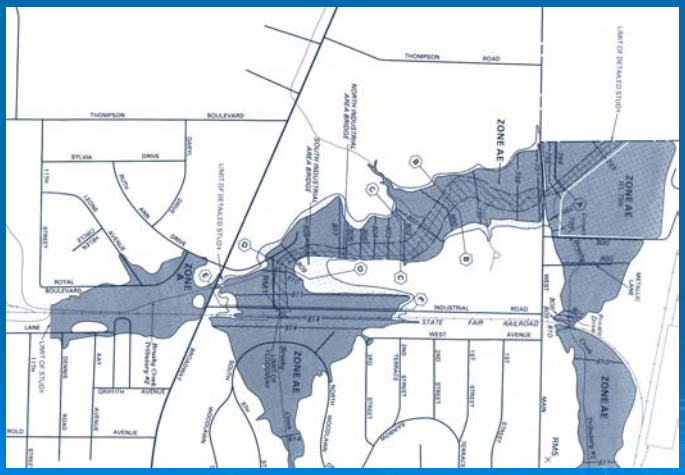
Basic Definitions

- Flood - Temporary condition of partial or complete inundation of normally dry areas from overflow of inland or tidal waters, rapid accumulation or runoff of surface waters from any source

Basic Definitions

- SFHA - Special Flood Hazard Area
  - Areas subject to a 1% or greater annual chance of flooding in a given year
  - Includes Zones A, AE, AO, and V
  - 500-year floodplain is NOT Special Flood Hazard Area

Special Flood Hazard Area



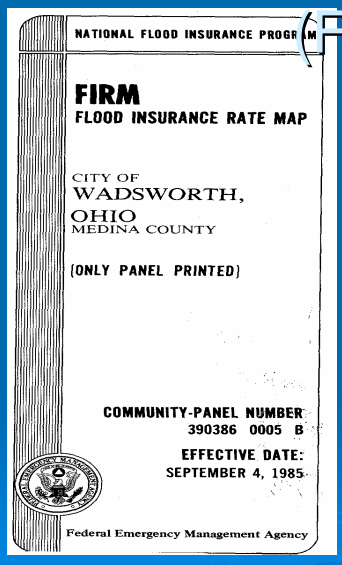
Basic Definitions

- BFE - Base Flood Elevation. The flooding elevation caused by the base flood which is the flood that has a 1% probability of being equaled or exceeded in any given year (also referred to as the 100-year flood or the 1% annual chance flood).

Basic Definitions

- FIRM - Flood Insurance Rate Map
- DFIRM – Digital Flood Insurance Rate Map
- FBFM - Flood Boundary Floodway Map
- FIS - Flood Insurance Study (includes FIRMs, FBFMs, and report with flood profiles)
- FDT - Floodway Data Table

Flood Insurance Rate Map (FIRM)


NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

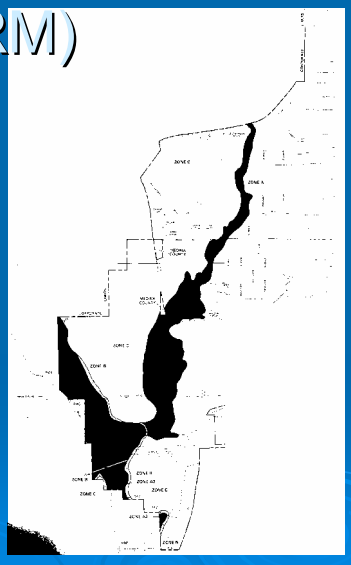
CITY OF
WADSWORTH,
OHIO
MEDINA COUNTY

(ONLY PANEL PRINTED)

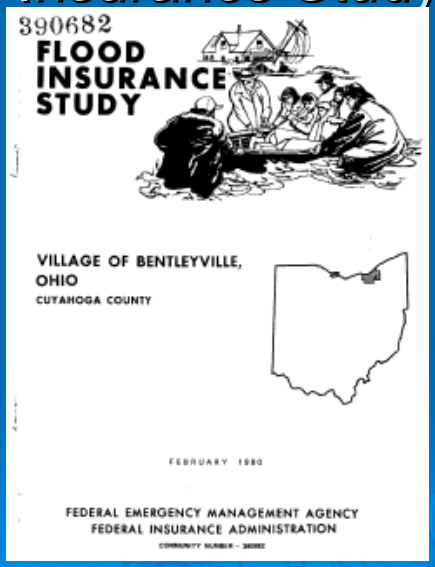
COMMUNITY-PANEL NUMBER
390386 0005 B

EFFECTIVE DATE:
SEPTEMBER 4, 1985

Federal Emergency Management Agency



Flood Insurance Study (FIS)



Summary of Discharges Table

TABLE 1
SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGES (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
AURORA BRANCH					
At confluence with Chagrin River	58	6,035	7,080	8,160	10,130
Approximately 1,450 feet Upstream of Solon Road	54	5,690	6,680	7,700	10,070
CHAGRIN RIVER					
Downstream Bentleyville Corporate limit	124	11,555	13,570	15,670	21,600
At confluence with Aurora Branch	61	6,325	7,425	8,565	11,700
TRIBUTARY NO. 1					
At mouth	2.39	384	587	683	911
TRIBUTARY NO. 2					
At mouth	1.48	283	437	511	684

Floodway Data Table

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AURORA BRANCH								
A	1,800	77	547	14.9	836.4	836.4	836.4	0.0
B	2,772	90	719	11.4	841.7	841.7	842.7	1.0
C	3,775	91	571	14.3	853.9	853.9	853.9	0.0
D	4,730	96	584	14.0	864.3	864.3	864.4	0.1
E	6,224	90	1,030	7.9	889.0	889.0	889.2	0.2
F	6,919	100	1,514	5.4	889.6	889.6	890.3	0.7
G	8,827	370	2,937	2.6	890.4	890.4	891.2	0.8
H	10,361	480	2,890	2.7	891.3	891.3	892.0	0.7
I	12,699	240	1,313	5.9	892.5	892.5	893.5	1.0
J	13,064	400	2,246	3.4	893.6	893.6	894.5	0.9
CHAGRIN RIVER								
A	619[2]	149	1,592	9.8	825.2	825.2	825.8	0.6
B	658[2]	152	1,577	9.8	825.2	825.2	825.9	0.7
C	1,383[2]	213	1,386	11.3	826.9	826.9	827.9	1.0
D	1,697[2]	260	1,847	8.5	829.3	829.3	829.3	0.0
E	2,200[2]	559	3,748	4.2	830.9	830.9	830.9	0.0
F	3,781[2]	163	1,765	4.9	834.7	834.7	835.4	0.7
G	5,155[2]	460	4,577	1.9	835.9	835.9	836.8	0.9
H	5,981[2]	166	1,240	6.9	835.9	835.9	836.5	0.6
I	6,837[2]	256	1,762	4.9	838.2	838.2	839.2	1.0

[1] Feet above confluence with Chagrin River
[2] Feet above corporate limits

TABLE 3

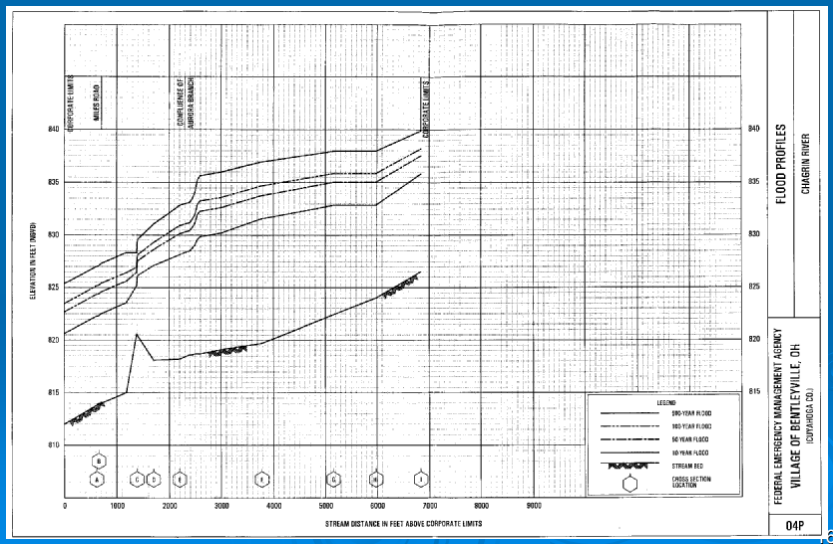
FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF BENTLEYVILLE, OH
(CUYAHOGA CO.)

FLOODWAY DATA

AURORA BRANCH - CHAGRIN RIVER

Flood Insurance Study (FIS) Profile



Basic Definitions

- Structure -
  - For floodplain management, walled and roofed building, including a gas or liquid storage tank, that is principally above ground (includes manufactured homes)
  - For insurance purposes, walled and roofed building, other than a gas or liquid storage tank, that is principally above ground and affixed to permanent site (includes manufactured homes on permanent foundations)

Structure and Flood

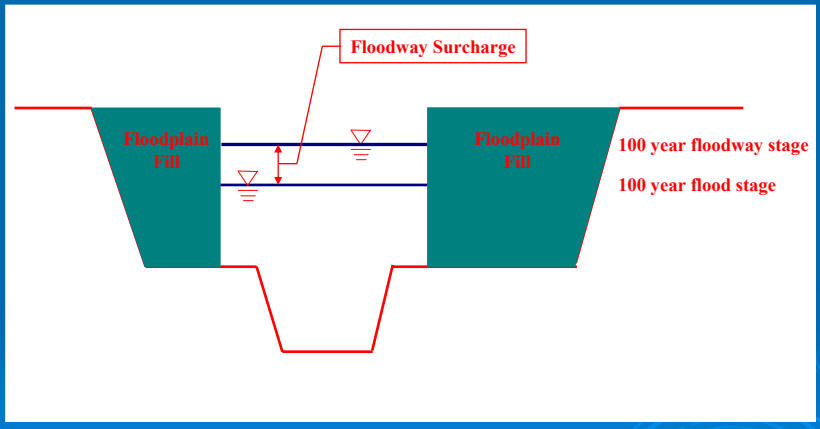
Basic Definitions

- Floodway – The critical area of the SFHA that must be preserved to allow passage of floods. Hydraulically, this is the area of most conveyance in the channel. The floodway is defined such that if fill is placed on both banks of the floodplain to the limits of the floodway, the new water surface elevation will be higher than the BFE without any fill placed by the amount of the Floodway Surcharge.

Basic Definitions

- Floodway surcharge – The difference in the elevation of the base flood and the floodway water surface elevation. In Indiana, this value is 0.1 feet.
- Encroachment – Any fill, structures, or other obstructions that infringe upon the floodway or floodplain and cause an increase in the BFE.

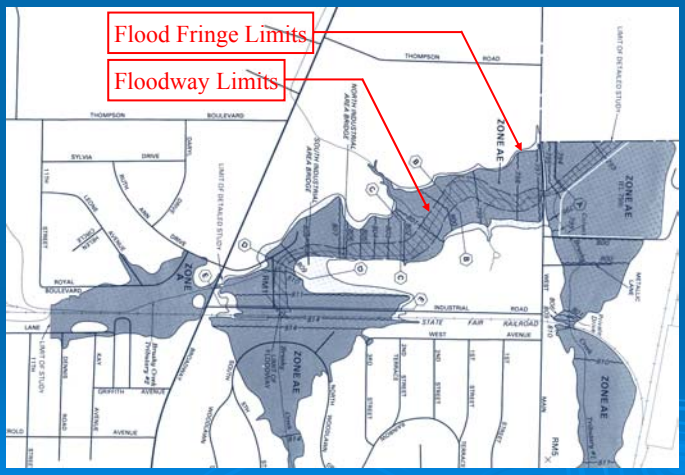
FEMA Floodway Modeling



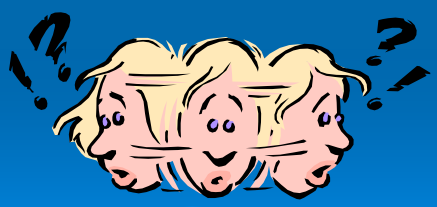
Basic Definitions

- Flood fringe – The area of the SFHA between the floodway and the 100-year flooding limits. When fill is placed in the flood fringe, this results in an increase in the BFE.

Floodway versus Flood Fringe



Why New Mapping?



Why New Mapping?

- Newly Studied Areas
- Physical Changes
- Improved Methodology/Data

What Happens with New Mapping?

What Happens with New Maps?

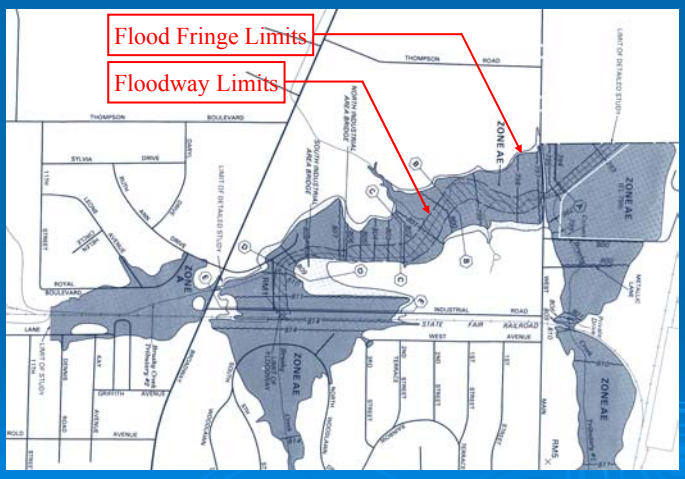
- Local regulatory agencies adopt
- Flood insurance requirements are based on the new maps
- Permit requirements are based on the new maps

FEMA Zone A Areas

FEMA Zone A Areas

- What are they?
- Why are they important?
- What to do about them?

Floodway versus Flood Fringe



A “Minor Site Assessment”

New IDNR Procedures

- IDNR will calculate the BFE and floodway limits only under these conditions:
  - Single residence and/or out building
  - Single residential lot
  - No other work proposed in the floodway

New IDNR Procedures

- Consultants now responsible for flood elevation recommendations – IDNR only reviews
- Implementation of ‘Two Strikes’ policy

New IDNR Procedures

- Consultants’ flood modeling submittals will be held to higher standards
- IDNR no longer participates in project specific flood model development – **serve only as reviewers**

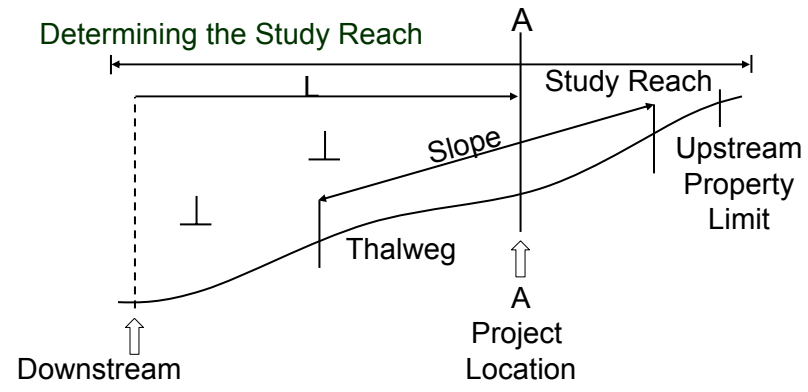
Process for Minor Site Assessment

- Use best-available mapping or survey data
- Typically, one cross-section is all that's required
- Bridges/culverts require more data

Process for Minor Site Assessment

- Calculate 100-year peak discharge
- Estimate required values to calculate approximate flow depth/BFE
- With Minor Site Assessment, IDNR considers all land below the calculated BFE as floodway

Detailed Hydraulic Analysis



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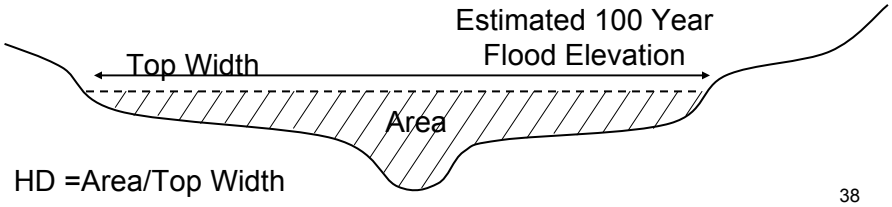

HD =Area/Top Width

Detailed Hydraulic Analysis

1. Effective Model
2. Duplicate Effective Model
3. Corrected Effective Model (Base Model)
4. Existing or Pre-Project Condition Model (Cumulative Effect Model)
5. Proposed or Post-Project Condition Model

Detailed Hydraulic Analysis

Why do modeling?

- Flood Insurance Study
- Revisions to Flood Insurance Study (LOMR)
- Special Studies
- Permits
- FARA – Floodplain Analysis Regulatory Assessment

Detailed Hydraulic Analysis

A. Effective Model

1) Published Flood Insurance Study

2) IDNR approved detailed hydraulic study

- IDNR Flood Insurance Study for areas not covered by FEMA mapping
- Detailed models on file with IDNR - Division of Water used to evaluate permits
  - May be used for Regulatory Purposes (Permits)
  - Should not assume FEMA acceptance

Detailed Hydraulic Analysis

D. Existing or Pre-Project Condition Model

1) Physical changes

- Reflects any man-made physical changes (structure, fills, encroachments, etc.) that occurred or are expected to occur in the near future (i.e., recently permitted projects) within the floodplain since the date of the Effective Model. It does not contain the proposed project; this model serves as the basis for evaluating cumulative effects.

Summary

- Definitions
- New Mapping
- Simplified and Detailed Analyses

Examples!!!

Questions & Answers